Breaking The Rules Of Sublimation

Jimmy Lamb
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A Note From The Speaker

Thanks for registering for my class, I think you will find it very worth your while and look forward to the opportunity to share my experiences with you.

I have created this handout as a supplement to the class, rather than as an exact outline of the presentation. I have a tendency to “fine-tune” the direction of the seminar based on the profiles of attendees, which means I may spend more time in some subject matters while skipping other topics (when warranted). Thus, I may not follow the hand-out as it’s written. Think of the handout as a resource, rather than a script.

Another point I wish to make, is that I prefer you to focus on the live content, rather than trying to follow along in the handout. I use lots of projected images and actual samples (when possible) so if you aren’t paying attention to the front of the classroom, you might miss something important. Plus, it would be impossible to document every bit of information that gets shared in the class, so if you are reading the handout trying to figure out where I am going next, you might get behind and miss out on something useful.

With that said, I do encourage you to print the handout and bring it to the class so that you have something to write your notes on, but don’t let it distract you from listening and asking questions.

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There is nothing like being a rebel – trust me I know. From an early age, I was rarely satisfied with the status quo or rules that seemed overly limiting. That’s not to say I was a troublemaker, rather it means that I questioned a lot of the wisdom that others handed down to me. Remember, it used to be an accepted fact that the world was flat... until one guy took a risk and set out to prove it wasn’t.

Though not nearly as dramatic as Columbus’s challenge, the product decoration industry has a lot of longstanding rules about what can and cannot be done. And in many cases, the rules really have proven to be true. But there are plenty of areas where the rules are not really cast in stone; in fact they are actually more like guidelines.

If you like to play it safe, then staying within the guidelines is perfectly acceptable as it removes risk and the potential to screw things up. But if you are like me and want to see just how far you can push the boundaries, you might end up with some cool new applications and techniques that will set you apart from your competitors. And you might also CRASH and BURN!!! Such is life in the world of rule breaking.

I started in the world of embroidery which is stifling in the way of rules. So of course I felt compelled to challenge them and did so on a routine basis. So when I crossed over into the world of digital decoration, and more specifically sublimation, I was met by a welcoming committee who saw fit to set down the rules for me.

There were three primary rules that I was told could not be broken:

1. You can only sublimate on white.
2. Products must have a polymer or polyester surface.
3. You must use very specific time, temperature and pressure settings.

And then I was hit with even more restrictions as follows:

4. Sublimation cannot be used on outdoor products due to UV issues.
5. You can only apply sublimation to flat surfaces (except for mugs).
6. The only products suitable for sublimation are ones that are manufactured for it.

Wow, nothing like a set of strict parameters to get my mind working on ways to get around them, or at least test their viability. So, let’s take a look at each one and see what really gives.
It Only Works On White

Without a doubt, this is the most commonly preached rule in the world of sublimation, but it’s wrong! As it turns out white is BEST color, but not the only one. To understand the limitations of color when it comes to sublimation production, you must first understand more about the chemistry of sublimation.

The first aspect is that sublimation is actually a dye (not truly an ink) that permeates and re-colors the fibers that it is applied to. In addition, dyes are translucent which means that the background color can have an impact on the ink color. Of course with any lightweight ink you have the same issue. For example, print a full-color image on a piece of white paper using your office printer. Now print the same image on a yellow piece of paper. Notice any difference????????? Of course you do. So not only is white the best color to sublimate on, it's also the best color for any ink process.

In reality, sublimation works fine on light colors and even some medium colors depending on the colors of the design. But as the background gets darker, the range of usable sublimation colors drops dramatically, as you can only use ink (dye) colors that are significantly darker than the background. Even then, you will eventually end up with a design being completely absorbed by the surface color.

Because of this problem, some printing applications such as screen printing make use of a special white ink that is applied directly to a colored surface to create a white base to which the rest of the design will be applied. It has to be carefully applied such that the forthcoming ink layers completely cover the contours of the white area. Once the white ink is cured, then the colored ink can be placed on top of it.

This layer of white ink has two purposes. The first is to create a white base that ensures the highest level of color vibrancy for the image being printed. The second is that areas of the design that need the color white are normally left “open” such that the background color comes through. To better understand this concept, print a design with large areas of white, such as a soccer ball, into white paper using your office printer. Now switch to yellow paper again. The soccer ball is now white, as the design was depending on the background color to create the white areas of the image.

With sublimation and many other digital ink processes, image colors are created by mixing together base ink colors. In a 4 color printer, that is typically C,M,Y,K (cyan, magenta, yellow, black). Notice that white is not one of the listed colors. Using these four base colors, you can create thousands, even millions of shades of color, but the one color you cannot create by mixing is white.

White is a special case color in the world of digital ink. It requires its own chemistry and can be very fickle to work with. In the case of printing, where you are applying inks to the surface, it can be applied as a base layer for everything else. But in the case of a dye like sublimation, the ink is permeating the fibers which can’t be done with white ink as it’s a coating. (It should be noted that white threads and fabric are created by bleaching, not by a dye process.)

Thus, white ink is not an option for sublimation, which does limit your options when dealing with any surface color other than white. But this is not as bad as it sounds, as it is only an issue where the design is smaller than the substrate being decorated – typically apparel. Considering that 90% of sublimation is done as a full-bleed process, you simply re-color the substrate as part of the design process.

And if you really want to apply the same concept to apparel, you can use the “all-over” printing process. With all-over printing, large scale prints (that completely cover the garment) are printed and pressed
using wide format equipment. Instead of starting with black shirt for example, you create it by sublimating a white shirt, with the background color being part of the design that is being printed, in this case black. Essentially, you are re-coloring the entire shirt while adding the design. Paintball jerseys are an example of a popular application for all-over printing. Obviously, this process requires large scale equipment, but you can always contract it out.

**It Only Works With Polymer Fibers**

In the world of digital inks, it’s important that you use the proper ink for the surface being decorated. Much like with painting, you would choose your paint based on the surface being painted. For example, metal paint for metal and wood paint for wood, rather than the other way around. It’s a matter of chemistry and bonding. The wrong choice will yield inferior results in the long run.

If you use the wrong ink for a digital printing application, the quality and longevity of the image will suffer. For example, with cotton shirts, you need to use an ink designed to bond to cotton fibers. But when dealing with polyester or polymer fibers, you need to look at a different type of desktop digital printing process – sublimation. (Both types of inks typically work on blends, but the colors may be muted.)

Sublimation uses the same production process as any other digital transfer. The real difference is in the chemical process.

Sublimation is actually a dye, and it’s formulated specifically for polymer fibers. During the heat press phase of production (400° F), two important things happen: the sublimation ink turns into a gas and the polymer fibers of the item being decorated open up. The sublimation ink then permeates the fibers as opposed to adhering to their surface. When the heat is removed the fibers close back up and permanently retain the sublimation dye. The end result is that with garments, the image will not fade, crack or peel with multiple laundering. In the case of hard products (substrates) the surface will not chip, scratch or peel.

The key to sublimation is the polymer fiber aspect, which when translated into the apparel mode means polyester garments. And with the ever increasing popularity of poly-performance products, which feature moisture-wicking capabilities, it’s important that you focus on using the right ink for the situation

Oh and by the way, those wonderful trucker’s style caps that are in vogue again? Most of them are polyester... which means sublimation is potentially ideal decoration process. Of course you will need a slightly different style of heat press to handle a cap, but sublimation is definitely a simple, inexpensive solution for decoration, which can otherwise be a bit of a pain to handle.

So in chemical terms, sublimation only bonds with polyester and polymer fibers, but that doesn’t mean you can’t do blended shirts. The process does work on fabrics that have less than 100% polyester content. However, the colors will appear faded and certainly won’t have the vibrancy as a pure polyester product. But by the same token, it makes for a nice “special effect” if you are shooting for a faded or retro look with a design.
In addition to coming off the heat press looking faded, a sublimated image on blended fabric will fade the first time it's laundered, as any stray ink that temporarily attached to non-poly fibers will be washed away.

**It Requires Exact Production Settings**

Sublimation is a chemical process thus there are certain physical parameters involved in making the transfer from paper to substrate occur properly. The standard settings are:

- **Time** – 60 seconds
- **Temperature** – 400 degrees
- **Pressure** – 40 psi

It takes a balance between all three to create highly quality, permanent images that won't crack, peel or fade when laundered. When you start manipulating the variables you can affect the quality of the image. But that doesn't mean you can't vary settings!

First of all, some substrates need different variables based on their physical characteristics. So be sure to read the manufacturer’s instructions to determine the best settings for the situation. But even then, some tweaking may be needed in order to fine tune the production process, as variances in heat presses, humidity, and transfer paper (to name a few) can affect the transfers of ink.

If you do feel compelled to vary the settings, do so in a scientific manner – adjust one variable at a time and note any difference. Continue this adjustments until you are satisfied with the result, then write it all down. And keep in mind that the best settings can vary between brands of substrates, especially if dealing with apparel.

**It Can't Be Used On Outdoor Products**

So it may be obvious by now, that the rules of sublimation are based on fact, but by the same token there is some room to experiment. The next item on the list evolves from the fact that sublimation is not UV resistant, so it will fade in direct sunlight over time. As a general rule of thumb, sublimation is not used for signage that is subject to long periods of intense sunlight. However, that doesn’t mean you can’t create outdoor products within reason.

First of all everything fades in sunlight! Thus, the average person expects and accepts fading as a fact of life. Thus, items like license plates, smaller signage, golf course flags, etc may do just fine when used outdoors. In fact, treat it as “recurring income” as natural fading will require that the product be replaced periodically. But be smart about your decisions and honest with the customer. A wall sign that is under an overhang will not fade as quickly as one on a post in the middle of a parking lot.

Some Decorators experiment with UV coatings for sublimated products. Nothing is wrong with experimentation, as long as it's not on a customer’s order... So far, there is no consensus on any ideal
solution. Some UV protectants appear to slightly retard fading, whereas others actually affect the quality of the image when applied.

**You Can Only Sublimate On Flat Surfaces**

This comes from the fact that you need “pressure” as part of the production process and of course most heat presses are flat. Thus, you are pretty much limited to flat items by virtue of the equipment options.

Of course the mug press is an exception, as it’s designed for narrow diameter cylindrical items like mugs and water bottle. It has very little range in the way of products beyond mugs, but there may be a few possibilities where you can sublimate something other than a mug in a mug press.

A better example is to take a closer look at mug wraps, which are stretched around a cylindrical object to hold the transfer in place while the substrate is placed in a convection oven rather than a heat press. Because wraps come in different styles and sizes, they can sometimes be used for other rounded products like pet bowls.

So the key here is to be familiar with the different production tools available to you and then see if they can be modified for other uses. And there are some new technologies in the works...

**It Only Works With Manufactured Products**

The point here is that you need a high quality, polymer or polyester surface to support high quality sublimation. Typically, products that are manufactured for sublimation (and there are hundreds of such items) are carefully machined to very specific tolerances in order to ensure an even and consistent surface that is permanent. The concept of applying an off-the shelf product like poly urethane just doesn’t work.

In reality, there are some DIY products that make it possible for you to add your own coatings, but before you rush out and promise something to a customer, you need to really put such products and processes to the test. Considering that most of the coating products are in aerosol form, the application process is the same as spray painting. And if you have ever done that before, then you should realize just how hard it is to get even coverage. Even worse, since many of the coatings are clear, you have no visual reference as to how well you are getting it applied.

Okay, so the reality here is that there are processes available, but the results may not be what you want, especially if you are dealing with finely detailed images. It’s certainly worth experimenting with, but proceed with extreme caution.

So that pretty much does it for the handout. We will discuss all of this in much more detail in class, so be ready to learn! See you there...
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Contact Me

jlamb@sawgrassink.com

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